

Patent Application No. 09/879,529

REMARKS

This Amendment is in response to the Office Action dated May 18, 2005. In the Office Action, claim 9 was objected to, claims 1, 5, 7-18, 20-31 were rejected under 35 USC §102, and claims 6 and 19 were rejected under 35 USC §103. By this Amendment, claim 9 is amended. Currently pending claims 1, 5, 6, 9-33 are believed allowable, with claims 1, 5, 6, 9, 10, 15, 16 and 18 being independent claims.

CLAIM OBJECTIONS:

Claim 9 was objected because it contained a grammatical error in the phrase "by doubled". OA, pg. 2. By this amendment, the phrase "by doubled" has been amended to "by double". The Applicants thank the Examiner for pointing out this typographical error.

CLAIM REJECTIONS UNDER 35 USC §102:

Claims 1, 5, 15, 20, 21, 24, 25 and 29 were rejected under 35 USC §102 as being anticipated by U.S. Patent No. 5,875,268 issued to Miyake ("Miyake"). OA, pg. 2.

Claims 7, 8, 10, 11, 12, 13, 14, 16, 17, 22, 26, 28 and 30 were rejected under 35 USC §102 as being anticipated by U.S. Patent No. 6,535,651 issued to Aoyama et al. ("Aoyama"). OA, pg. 13.

Claims 9, 18, 23 and 27 were rejected under 35 USC §102 as being anticipated by U.S. Patent No. 5,649,034 issued to Sonobe ("Sonobe"). OA, pg. 23. The Examiner later states that "[c]laims 27 and 31 are rejected the same as claim 23." OA, pg. 26. It is thus apparent that the Examiner also intended to reject claim 31 under 35 USC §102 as being anticipated by U.S. Patent No. 5,649,034 issued to Sonobe ("Sonobe").

To anticipate a claim under 35 USC §102, a reference must teach every element of the claim. MPEP 2131.

Claim 15:

Claim 15 recites, in part, ". . . using a rank order processing to generate a final expanded image." In rejecting claim 15, the Office Action alleges that Miyake teaches a rank order processing method for reducing the vertical and horizontal directional correlation of an image. The Office

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Action cites a "SORTING MEANS which contains a 'ranking' process mentioned in col. 17, line 16." OA, pg. 4. The Applicants respectfully submit that Miyake is devoid of any teaching or suggestion of rank order processing as the term is used by the Applicants.

The specification provides the following example of "rank order processing":

[0062] FIGS. 3A and 3B are diagrams for explaining the reduction of a step-shape of boundary using the above described rank order processing. In FIG. 3A is shown the state obtained through the expansion process for which the vertical and horizontal linear interpolation 13 in FIG. 1 is used, and in FIG. 3B is shown the state obtained when the vertical and horizontal directional correlation reduction process 14 in FIG. 1 is used. In FIGS. 3A and 3B, the pixel values in 49, 7x7 windows are represented as expansion results, with "32", for example, being defined as bright and "0" being defined as dark. A thick solid line indicates a boundary line, and as is indicated by the thick solid line in FIG. 3A, a boundary having large steps occurs as the result of the expansion process for which only the vertical and horizontal linear interpolation 13 is used.

[0063] In this embodiment, the rank order processing is performed after the expansion process in FIG. 3A for which the vertical and horizontal linear interpolation 13 is used. Specifically, the rank order processing is performed by raster-scanning a window, enclosed by a broken line 21 in FIG. 3A, in the direction indicated by an arrow 22, and the pixel positions are adjusted in accordance with the even numbers of the pixels in the window. In the area enclosed by the broken line 21, four windows are defined by a pixel 23 at the second row and the second column, a pre-scan pixel (second row and first column) and the pixels along the preceding line (first row and first column and second column), and the median operation, for example, is performed for the four windows to determine the output value for the pixel 23 on the second row in the second column. The results obtained by the rank order processing are shown in FIG. 3B. The "*" symbols along the first row and along the first column represent "Don't care", because the values of the pixels before the scanning and along the preceding row are unknown.

[0064] The pixel, for example, on the second row in the sixth column in FIG. 3A is "0". When the median operation is performed for this pixel, the pre-scan pixel (second row and fifth column) is "32" and the pixels along the preceding row are "32" and "0". When these pixels are rearranged in the ascending order, "0, 0, 32, 32", the median value is "16". As a result, as is shown in FIG. 3b, the pixel on the second row in the sixth column is transformed to "16". Similarly, the pixel, for example, on the third row in the fourth column in FIG. 3A is "0", and the vertical

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and horizontal pixel values in the window are rearranged in the ascending order, "0, 32, 32, 32". Therefore, the median value is "32", and the output value is indicated on the third row in the fourth column in FIG. 3B. When the rank order processing has been performed in this manner, it is apparent that, as indicated by the thick solid line in FIG. 3B, the large steps are removed from the boundary, and further, the boundary is interpolated with the median values. As a result, a clear and smooth expanded image can be obtained at the current resolution. App., para. 0062-0064.

It is emphasized that in the preceding passage, the rank order processing is determined in part by the position of a specific pixel under analysis. In the algorithm disclosed, the value of a pixel determined by rank order processing is determined by a median operation having as inputs not only the pixel under analysis but also its neighbors. If the same pixel existed at another location, this algorithm for rank order processing may return a different output value for that pixel because its neighbors may have different values.

Claim 15 does not require the usage of the algorithm disclosed in the passage above for rank order processing. Nonetheless, the exemplary algorithm is intended to demonstrate the concept denoted by the term "rank order processing." Thus, it follows that the term "rank order processing", as used by the Applicants, indicates a method of processing matrix data based in part on the positions of individual values of the matrix. It is noted that the term "matrix" is used herein in the mathematical sense, e.g., a two-dimensional array of values. Furthermore, it follows that support for this definition is provided in the specification. It is noted that the Applicants can act as their own lexicographers and define in the claims what they regard as their invention essentially in whatever terms they choose so long as any special meaning assigned to a term is clearly set forth in the specification. MPEP 2173.01.

Furthermore, the specification clarifies that "rank order processing" as used therein is distinct from mere sorting. A passage from the specification illustrates: ". . . or a process for repetitively copying the pixels in the mask and sorting them, and for performing a rank order processing for the sorted results can be employed." App., para. 0059. In the preceding passage, the results have already been sorted at the point in time where rank order processing is performed. If rank order processing were

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simply a type of sorting, the rank order processing would be redundant. It follows that rank order processing is not equivalent to sorting.

By contrast, the term "ranking" in the passage of Miyake cited by the Examiner refers to a sorting of pixels. The passage is reproduced below to provide additional clarification and context:

The DOTMAX/DOTMIN comparator 432 compares the **numbers of pixels** sent thereto in order to determine which is smaller. The smaller number of pixels is sent to the sorting means 431. This comparison may be performed by comparing the numbers of pixels against each other. Alternatively, either number of pixels, e.g., DOTMAX only, may be calculated and DOTMAX may then be compared to determine whether it is larger or smaller than 1/2 of the number of pixels (N×M) of the block. For example, DOTMIN is sent to the sorting means 431 if it is larger than 1/2 and DOTMAX is sent to the sorting means 431 if it is smaller than 1/2. As a result, it will suffice for the **sorting means 431 to perform ranking of a maximum of (N×M/2) pixels**. By thus simplifying the sorting means, processing can be executed at higher speed. Miyake, col. 17, ln. 4-18 (emphasis added).

In the preceding passage, "ranking" is used to denote a sorting of pixels based on their values. The ranking is performed by a "sorting means." Miyake, col. 17, ln. 15. The very name of the "sorting means" implies that it exists to sort data. It follows that "ranking", as the term is used by Miyake, is performed as part of a sorting operation. By contrast, as previously demonstrated, "rank order processing" is not equivalent to a sorting operation. Therefore, "ranking" cannot be equivalent to "rank order processing."

It is further noted that the "ranking" method disclosed in the preceding passage of Miyake is not based on the positions of pixels within a matrix. In this "ranking" method, only a subset of the pixels are processed by the sorting means. This fact precludes the use of algorithms based on a pixel's position within a matrix, as context information provided by other elements in the matrix is not guaranteed to be available to the sorting means. Another passage of Miyake elaborates: "sorting means 417, which sorts the linearly interpolated pixels within the block in descending order of pixel values." Miyake, col. 14, ln. 54-56. While the pixels are ultimately taken from a rectangular "block", this second passage clearly teaches that the sorting process is based solely on the values of the individual pixels. This precludes the possibility that the position within

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the matrix is used by the "ranking" method. Because the "ranking" and sorting methods taught by Miyake are not dependent on position within a matrix, they cannot be equivalent to "rank order processing" methods which take into account the position of a value within a matrix.

For at least these reasons, the Applicants respectfully submit that claim 15 is not anticipated by Miyake and earnestly solicit allowance of the claim.

Claim 5:

In rejecting claim 5, the Office Action alleges that an "argument similar to that presented above for the apparatus claim 15 is equally applicable to the method of claim 5." OA, pg. 5. \

Since claim 15 is believed allowable, claim 5 is also believed allowable for at least the same reasons as claim 15. The Applicants therefore earnestly solicit allowance of the claim.

Claim 1:

Claim 1 recites, in part, ". . . using said neighboring pixels to generate second expanded image data by determining an interpolation direction based on values of differences between said target pixel and said neighboring pixels . . ." In rejecting claim 1, the Office Action alleges that Miyake teaches determining an interpolation direction based on values of differences between a target pixel and its neighboring pixels.

The Office Action cites "Fig. 29, num. 105: MULTIPLIER performs linear interpolation as shown in fig. 10A where interpolated values as shown by 'X' which correspond to fig. 29, label: LINEARLY INTERPOLATED INFORMATION based on 'correlation' in col. 8, line 3 with a target pixel or PIXEL OF INTEREST as show [sic] in fig. 10A, central circle symbol, and neighboring pixels shown in fig. 10A as 'MAX (8 NEIGHBORING PIXELS)' arranged in oblique directions as shown in fig. 9, num. 131, where pixel of interest M is arrange in an oblique direction with respect to pixels G, Q, S and I are used to generate second expanded image data as shown by a line of X and O symbols in fig. 10A by determining an interpolation direction using fig. 9, num. 136: EDGE-ANGLE DISCRIMINATING MEANS based on values of differences as shown in fig. 9, numerals 134 and 135.) between said target pixel and said neighboring

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pixels . . . " OA, pg. 11. The Applicants respectfully submit that Miyake is devoid of any teaching or suggestion of determining an interpolation direction.

The specification discusses a method by which the present invention may determine an interpolation direction:

[0076] FIG. 4 is a flowchart for explaining the processing performed by the oblique interpolation unit 15. In this embodiment, basically, **the interpolation direction determination process 16 is performed**, and then the oblique linear interpolation process 17 is performed, wherein pixels in the interpolation direction are employed for linear interpolation.

[0077] First, the neighboring pixels at an inverse projected point of a target expansion point are obtained from the original image data input unit 11 (step 201), and differences for the horizontal and the vertical, and the right and the left oblique directions are calculated (step 202). Specifically, when inverse projection is performed from the target coordinates obtained by expansion to the original coordinates, four peripheral pixels are employed to calculate differences in the horizontal and the vertical, and the right and the left oblique directions. Then, the differences are compared with each other, i.e., a check is performed to determine whether the horizontal or vertical difference is equal to or smaller than a threshold value (step 203).

[0078] When the horizontal or the vertical difference is equal to or smaller than the threshold value, a check is performed to determine whether the difference in the left oblique direction is equal to or smaller than the threshold value (step 204). And if the difference in the left oblique direction is equal to or smaller than the threshold value, a check is performed to determine whether the difference in the right oblique direction is equal to or smaller than the threshold value (step 205). Then, should the difference be equal to or smaller than the threshold value, i.e., when the difference in each of the two oblique directions is equal to or smaller than the threshold value, the vertical and horizontal directions are determined to be interpolation directions (step 210). Whereas if at step 205 the difference in the right oblique direction is greater than the threshold value, the left oblique direction is determined to be the interpolation direction (step 211). If at step 204 the left oblique direction is found to be greater than the threshold value, a check is performed to determine whether the difference in the right oblique direction is equal to or smaller than the threshold value (step 206). In this case, if the difference in the right oblique direction is equal to or smaller than the threshold value, the right oblique direction is determined to be the interpolation direction (step 212). But if at step 206 the difference in the right oblique direction is found to be greater than the threshold value, then the vertical and horizontal directions are determined

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to be interpolation directions (step 213).

[0079] If at step 203 the difference in the horizontal or vertical direction is greater than the threshold value, a check is performed to determine whether the difference in the left oblique direction is equal to or smaller than the threshold value (step 207). Then, when that difference is equal to or smaller than the threshold value, a check is performed to determine whether the right oblique difference is equal to or smaller than the threshold value (step 208). And if the difference is equal to or smaller than the threshold value, i.e., when the difference in each of the two oblique directions is equal to or smaller than the threshold value, the directional search is performed using the cumulative value of the differences (step 214). But when at step 208 the difference in the right oblique direction is greater than the threshold value, the left oblique direction is determined to be the interpolation direction (step 215). Again, if at step 207 the difference in the left oblique direction is greater than the threshold value, a check is then performed to determine whether the difference in the right oblique direction is equal to or smaller than the threshold value (step 209). And when the difference in the right oblique direction is equal to or smaller than the threshold value, the right oblique direction is determined to be the interpolation direction (step 216). If, however, at step 209 the difference in the right oblique direction is greater than the threshold value, the directional search is performed using a doubled difference (step 217). It should be noted that the threshold value used throughout this process is an arbitrary value, determined while consideration is given to the states of the pixels, and is stored in a memory (not shown).

[0080] Finally, based on a determination made at one of steps 210 to 217, linear interpolation is performed using pixels arranged in the interpolation direction (step 218). Thereafter, the results obtained by linear interpolation are output to the final result generator 18. App., para. 0076-0080 (emphasis added).

The preceding passage provides a detailed algorithm by which the interpolation direction may be determined. The interpolation direction is determined to be right oblique, left oblique, horizontal or vertical. The direction thus determined is used to perform an interpolating operation on the pixels. It is emphasized that this direction, as the term "direction" is used by the Applicants, is in terms of the Cartesian or (x,y) plane on which the pixel data exists.

The Office Action cites Fig. 10A of Miyake as an example of linear interpolation as taught by Miyake. The Applicants respectfully submit that Fig. 10A of Miyake does not demonstrate a direction of interpolation, nor does it demonstrate the determination thereof. Miyake clarifies Figs. 10A

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and Fig. 10B by stating, "This is illustrated along a direction in one dimension in order to simplify the description." Miyake, col. 7, ln. 53-54. It is emphasized that the cited passage specifies no direction in particular and makes no mention of how the direction is determined. Therefore, Figs. 10A and 10B cannot by themselves demonstrate determining an interpolation direction.

Nonetheless, the cited passage of Miyake suggests that the horizontal axis of Figs. 10A and 10B corresponds to the direction of interpolation. Furthermore, it is noted that in Figs. 10A and 10B, the MAX values are located at a higher position vertically than the MIN values, with the original pixel of interest located vertically between the two extremes. Miyake, figs. 10A and 10B. This suggests that the vertical axis of Figs. 10A and 10B represents the value of the pixels, as opposed to representing a direction oblique to the direction of interpolation.

The Office Action alleges that Miyake teaches an edge-angle discriminating means which determines an interpolation direction. The following passage of Miyake describes in detail the workings of the edge-angle discriminating means:

Numeral 130 denotes an input terminal from which low-resolution information indicated at 131 enters. The low-resolution information 131 includes a pixel of interest M. The eight surrounding pixels enclosed by the bold line are referred to as "eight neighboring pixels" and the peripheral pixels enclosed by the one-dot chain line are referred to as "24 neighboring pixels". Numeral 132 denotes MAX/MIN detecting means for the eight neighboring pixels, and 133 MAX/MIN detecting means for the 24 neighboring pixels. The MAX and MIN detected by MAX/MIN detecting means for eight neighboring pixels 132 are applied to a subtractor 134 which obtains the difference between them, and MAX and MIN detected by detecting means 133 are applied to a subtractor 135 which obtains the difference between them. This processing corresponds to obtaining the dynamic range in the eight neighboring pixels and the dynamic range in the 24 neighboring pixels which include the above-mentioned eight pixels. On the basis of the dynamic ranges obtained, edge-angle discriminating means 136 discriminates how steep an edge is. The manner in which this is performed is illustrated in FIGS. 10A, 10B. Miyake, col. 7, ln. 29-49.

In the preceding passage, the maximum and minimum values within the eight pixels surrounding a pixel of interest is computed. Generally, the calculation of the minimum and maximum value of a set of values depends only

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on the values themselves and not on context information such as position. Specifically, no mention is made by Miyake that the positions of pixels in relation to the pixel of interest is considered in determining the minimum and maximum. Thus, the determined minimum and maximum values do not comprise position or direction information.

A subtracting operation is then performed on the minimum and maximum to determine a range. As previously discussed, the inputs to the subtracting operation (the minimum and maximum) are both scalar values. Thus, it is evident that the output of the subtracting information is a single scalar value (the range). It is thus evident that the scalar value returned fails to comprise position or direction information.

This process is repeated for the twenty-four pixels surrounding the same pixel of interest. This second process is analogous to the preceding case except for considering a greater number of pixels, so the range it determines likewise fails to comprise position or direction information.

The edge-angle discriminating means then uses both ranges thus determined. To reiterate, "On the basis of the dynamic ranges obtained, edge-angle discriminating means 136 discriminates how steep an edge is." Miyake, col. 7, ln. 46-48. Because the inputs used by the edge-angle discriminating means are not based on position or direction, the output of the edge-angle discriminating means, namely the steepness of the edge, likewise cannot be based on position or direction. Because determining the steepness of the edge is not based on direction, it cannot be equivalent to determining an interpolation direction.

Furthermore, claim 1 recites, in part, ". . . reducing correlation in the vertical and horizontal directions of an image that is linearly expanded in the vertical and horizontal directions to generate first expanded image data by a rank order processing . . ." For the reasons previously discussed in regards to claim 15, Miyake does not teach or suggest a rank order processing. Therefore, Miyake fails to teach or suggest the cited limitation of claim 1.

For at least these reasons, the Applicants respectfully submit that claim 1 is not anticipated by Miyake and earnestly solicit allowance of the claim.

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Claims 20 and 24:

Claims 20 and 24 are dependent on and further limit claim 1. Since claim 1 is believed allowable, claims 20 and 24 are also believed allowable for at least the same reasons as claim 1.

Claims 21 and 25:

Claims 21 and 25 are dependent on and further limit claim 5. Since claim 5 is believed allowable, claims 21 and 25 are also believed allowable for at least the same reasons as claim 5.

Claim 29:

Claim 29 is dependent on and further limits claim 15. Since claim 15 is believed allowable, claim 29 is also believed allowable for at least the same reasons as claim 15.

Claim 10:

Claim 10 recites, in part, ". . . vertical and horizontal directional correlation reduction means for reducing correlation of the obtained image in the vertical and horizontal directions . . ." The Applicants respectfully submit that Aoyama is devoid of any teaching or suggestion of a directional correlation reduction means.

In rejecting claim 10, the Examiner alleges that "according to the specification the claimed reduction performs 'reducing the step-shape or chain shapes of oblique lines' on page 14 of the specification which Aoyama et al. does using fig. 1, num. 46 which reduces or 'a step-like pattern is not enlarged at the oblique image edge portion' in col. 34, lines 66, 67." OA, pg. 17.

The relevant passage of the specification states, ". . . first image expansion means for outputting an expanded image wherein the vertical and horizontal structure is maintained with reducing the step-shapes or chain-shapes of oblique lines in the linearly expanded image. App., para. 0027. The Applicants respectfully submit that neither the cited passage of Aoyama nor the cited passage of the specification contains any mention of directional correlation reduction means. A directional correlation reduction means may, as described by the specification, beneficially reduce the step-shapes or chain-shapes of oblique lines. However, other techniques exist in

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the art for reducing step-shapes. Therefore, the converse is not necessarily true; reducing step-shapes does not necessarily involve directional correlation reduction. Thus, a teaching or suggestion of reducing step-shapes or similar figures is not equivalent to a teaching or suggestion of directional correlation reduction.

In rejecting claim 10, the Office Action further alleges that Aoyama teaches a vertical and horizontal directional correlation means. The Office Action cites "Fig. 1, num. 46: SECOND OPERATION MEANS is a means for vertical and horizontal directional correlation reduction or 'an interpolation point having a markedly different signal value does not occur on the image edge portion' in col. 30, line 54-56 and in col. 34, lines 64-66; thus, 'a step-like pattern is not enlarged at the oblique image edge portion' in col. 34, lines 66, 67. OA, pg. 17. The cited passages of Aoyama are reproduced below:

In cases where the direction, along which the image edge portion extends, is the vertical direction or the horizontal direction, even if the interpolating operation depending upon the original image signal components representing the four lattice points described above is carried out, an interpolation point having a markedly different signal value does not occur on the image edge portion. Aoyama, col. 30, ln. 50-56.

As described above, with this embodiment of the interpolating operation apparatus, in cases where the interpolation point is located at the image edge portion, three or four sampling points appropriate for the calculation of the secondary image signal component corresponding to the interpolation point are selected, and the secondary image signal component is calculated from the original image signal components representing the selected sampling points. Therefore, **a markedly different signal value is not given to the interpolation point**, which is located at the image edge portion. Accordingly, a step-like pattern is not enlarged at the oblique image edge portion. Aoyama, col. 34, ln. 56-67 (emphasis added.)

The Applicants respectfully submit that the cited passages contain no teaching or suggestion of a directional correlation reduction means. While the cited passage teaches a method to reduce a step-like pattern, this is not equivalent to a directional correlation reduction means for the reasons previously discussed. Furthermore, correlation is a degree of likeness between two things. The cited passage discusses a method to avoid assigning a value to the interpolation point which is very different from the values of

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its neighbors. It follows that the method causes the point to be given a value which is more similar to the values of its neighbors than would have otherwise been the case. By definition, this increases the correlation of the interpolation point with its neighbors. Increasing is the opposite of reducing. Thus, it is preposterous to assert that the cited passage discloses a directional correlation reduction means.

For at least these reasons, the Applicants respectfully submit that claim 10 is not anticipated by Aoyama and earnestly solicit allowance of the claim.

Claims 11-14 and 28:

Claims 11-14 and 28 are dependent on and further limit claim 10. Since claim 10 is believed allowable, claims 11-14 and 28 are also believed allowable for at least the same reasons as claim 10.

Claim 9:

Claim 9 recites, in part, ". . . a second process step of expanding, in the oblique direction, the structure of said original image data, and reducing a bulging shape appearing when a portion is expanded whereat vertical and horizontal lines of said original image data cross each other . . ." It is noted that the cited limitation of claim 9 specifies that the bulging shape is caused by the expansion of the original image data in an oblique direction. The Applicants respectfully submit that Sonobe is devoid of any teaching or suggestion of reducing a bulging shape.

In rejecting claim 9, the Examiner alleges that "Fig. 10, label 18 shows a top portion with six black squares of the letter/character that has a bulging shape that is reduced or smoothed in relation to a bulging shape as shown by the top portion of the letter/character as shown in label 2 that has 4 black squares that form a black square where the bulging top portion of label 18 appears when the top portion of label 1 of fig. 10 is expanded as shown in label 2 of fig. 10 whereat vertical and horizontal lines of said original image cross each other as shown as a black plus sign in fig. 10, label '2'." OA, pg. 25.

The steps taught in Fig. 10 of Sonobe are performed chronologically in increasing numerical order, beginning with step 1 and ending with step 19.

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Sonobe specifies that "numerals 1 to 19 shown in FIG. 10 correspond to numerals within parentheses representing the following steps, respectively." Sonobe, col. 5, ln. 28-30. Steps 1 through 19 are then detailed below in increasing numerical order. Sonobe, col. 5-6. It follows that the steps are intended to be performed in order, with higher-numbered steps intended to be performed after lower-numbered steps. The top portion with six black squares, which the Examiner alleges to be equivalent to a bulging shape, appears in label 18. Step 19 (corresponding to label 19) is the only step occurring after step 18 (corresponding to label 18). Thus, step 19 is the only step that operates on the output displayed at label 18. However, label 19 (resulting from step 19) also includes the top portion with six black squares. Because the final result of the process includes the bulging shape, the process of Fig. 10 of Sonobe clearly fails to teach or suggest reducing a bulging shape.

Furthermore, the cited claim limitation expressly concerns reducing a bulging shape resulting from an expanding operation in an oblique direction. Sonobe teaches that at Step 2 of the process of Fig. 10, "[t]he data of FONTORG is enlarged twice in length and is then stored in FONTORG." Sonobe, col. 5, ln. 45-46. Sonobe makes no other mention of expanding data in the steps corresponding to Fig. 10. Thus, Step 2 is the only step in the process taught by Sonobe at which an expanding operation occurs. At label 2 of Fig. 10, which results from step 2 of the process, no bulging shape exists. To use the Examiner's own verbal description of the relevant portion of label 2, "vertical and horizontal lines of said original image cross each other as shown as a black plus sign in fig. 10, label '2'." OA, pg. 25. It follows that any bulging shape visible at a later stage of the process, such as at label 18 or label 19, results not from an expanding operation but rather from another operation which is not equivalent to an expanding operation. Therefore, the process taught by Fig. 10 of Sonobe cannot be equivalent to reducing a bulging shape resulting from an expanding operation.

For at least these reasons, the Applicants respectfully submit that claim 9 is not anticipated by Sonobe and earnestly solicit allowance of the claim.

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Claim 18:

In rejecting claim 18, the Office Action alleges that an "argument similar to that presented above for claim 9 is equally applicable to claim 18 except for the additional limitation of a means disclosed by Sonobe..." OA, pg. 25. Thus, the reasons why Claim 9 is believed allowable apply equally to Claim 18.

For at least these reasons, the Applicants respectfully submit that claim 18 is not anticipated by Sonobe and earnestly solicit allowance of the claim.

Claims 23 and 27:

Claims 23 and 27 are dependent on and further limit claim 9. Since claim 9 is believed allowable, claims 23 and 27 are also believed allowable for at least the same reasons as claim 9.

Claim 31:

Claim 31 is dependent on and further limits claim 18. Since claim 18 is believed allowable, claim 31 is also believed allowable for at least the same reasons as claim 31.

CLAIM REJECTIONS UNDER 35 USC §103:

Claim 6 was rejected under 35 USC §103 as obvious over U.S Patent No. 5,917,963 to Miyake ("Miyake") in view of U.S Patent No. 6,285,798 to Lee et al. ("Lee").

Claim 19 was rejected under 35 USC §103 as obvious over U.S Patent No. 5,649,034 to Sonobe ("Sonobe") in view of U.S Patent No. 4,907,282 to Daly et al. ("Daly").

A *prima facie* case for obviousness can only be made if the combined reference documents teach or suggest all the claim limitations. MPEP 2143.

Claim 6:

Claim 6 recites, in part, ". . . determining, for said expanded image, whether the contrast in said original image data can be maintained at a predetermined level . . ." In rejecting claim 6, the Examiner alleges that this claim limitation is taught by Miyake: "Fig.

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1, num. 107: LUT determines for said expanded image of fig. 5, num. 109 whether the contrast or 'sharpness' in col. 7, line 13 mentioned in the context of 'contrast data' in col. 7, line 10 in said 'original [image] data' in col. 7, line 15 outputted from fig. 5, num. 101: LINE BUFFER can be maintained or 'controlled' in col. 7, line 14 at a predetermined level or 'depending on a size of an edge associated with the original data' in col. 7, lines 14, 15." OA, pg. 28. The Applicants respectfully submit that the cited limitation of claim 6 is not taught by Miyake.

The passage of Miyake cited by the Examiner is reproduced below:

Further, not only by a relative value to the difference value b but also by an absolute value of the contrast value c, whether original data having low resolution corresponds to an edge portion where contrast is large, or to a plain portion, can be readily determined by inputting contrast data of the MAX and MIN values into the LUT. If the original data corresponds to the plain portion, edge generation is not necessary, and sharpness of an edge having high resolution can be controlled depending on a size of an edge associated with the original data. Note that a value of the LUT may be optimized with an output engine and experimentally calculated. Miyake, col. 7, ln. 6-17.

The Applicants respectfully submit that the cited passage contains no mention of determining whether the contrast in an image can be maintained at a predetermined level. The cited passage teaches that the contrast or sharpness of an edge can be controlled. Specifically, "sharpness of an edge having high resolution can be controlled depending on a size of an edge associated with the original data." Miyake, col. 7, ln. 13-15. However, controlling is clearly not equivalent to determining. It follows that controlling contrast is not equivalent to determining whether a contrast can be maintained. Furthermore, no mention is made by Miyake that the contrast can be controlled only for a range of edge sizes. It is thus evident that the words "depending on" indicate that the edge size is an input factor to the calculations taught by Miyake, as opposed to indicating that the edge size is used to determine whether or not the contrast can be controlled.

Furthermore, the Examiner alleges that the LUT performs a complex series of calculations to determine whether the contrast in an image can be maintained at a predetermined level. The LUT taught by Miyake is a look-up table. A look-up table, as the term is used in the art, simply equates input

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values to output values. Miyake describes the LUT as follows: "The contrast value c and the difference value $b(i, j)$ calculated in the foregoing manner are transmitted to an LUT (look-up table) 107 and a predetermined value is outputted..." Miyake, col. 6, ln. 17-20. The description clarifies that the LUT taught by Miyake receives inputs whose values have previously been calculated and returns a previously calculated output value corresponding to the input values. Thus, the LUT performs no calculations other than a simple table look-up. It is therefore impossible for the LUT to perform the cited limitation of Claim 6 as alleged by the Examiner.

For at least these reasons, the Applicants respectfully submit that claim 6 is not obvious in view of Miyake and Lee and earnestly solicit allowance of the claim.

Claim 19:

Claim 19 is dependent on Claim 18 and recites, "The image display device according to claim 18, wherein said original color image data includes thin lines obtained by anti-aliasing, and said second image expansion means performs interpolation based on pixels constituting the original thin lines, not based on pixels obtained by anti-aliasing." In rejecting claim 19, the Examiner alleges that Daly teaches the limitation introduced by Claim 19. Specifically, "Fig. 13b, num. 1329: LOOK UP VALUE IN INTERPOLATE TABLE is a means that performs interpolation based on pixels from fig. 2b constituting original thin lines as shown as a grid, not based on pixels obtained by anti-aliasing via fig. 13b, num. 1327: SUBTRACT BACKGROUND COLOUR FROM DRAWING COLOR that removes the background color or the grid of lines as shown in fig. 2a and performs interpolation in a subsequent step 1329." OA, pg. 31. The Applicants respectfully submit that Daly does not teach or suggest the limitations introduced by Claim 19.

The Applicants respectfully submit that the thin lines shown in Figs. 2A and 2B of Daly are not equivalent to the thin lines of Claim 19. Daly describes Fig. 2A and 2B as follows:

FIG. 2a is a diagram illustrating the graphic display of a character at a relatively high (96x96 pixels) resolution grid.

FIG. 2b is a diagram illustrating the graphic display of a character at a medium (48x48 pixels) resolution grid. Daly, col. 6, ln. 41-46.

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Fig. 2A of Daly shows a high-resolution version of a lower-case letter "b". It is apparent from the drawing that the thin lines exist to illustrate the boundary between pixels rather than constituting image data in and of themselves. The image data is the letter "b". Because the letter "b" is not expressed using a grid of thin lines, the grid of thin lines is clearly not part of the image data itself. Further clarification is provided by contrasting Fig. 2A with Fig. 2B, which contains the same letter "b", albeit at a lower resolution. Because Fig. 2B has fewer pixels, there are fewer thin lines illustrating boundaries between the pixels. By contrast, the thin lines of Claim 19 are part of the image data itself. Claim 19 recites, in part, ". . . original color image data includes thin lines . . ." Because the thin lines of Figs. 2A and 2B are not part of the image data itself, they are not equivalent to thin lines as required by Claim 19.

Claim 19 additionally requires thin lines that are obtained by anti-aliasing. The Examiner alleges that Daly teaches anti-aliasing: ". . . pixels obtained by anti-aliasing via fig. 13b, num. 1327: SUBTRACT BACKGROUND COLOUR FROM DRAWING COLOR that removes the background color or the grid of lines as shown in fig. 2a . . ." OA, pg. 31. As previously discussed, the grid of lines is not equivalent to thin lines as contemplated by Claim 19. Furthermore, the grid of lines is a demonstration tool. For the reasons previously discussed, it is not actual data available to be manipulated by the method of the present invention. Because the SUBTRACT BACKGROUND COLOUR FROM DRAWING COLOR does not have access to the grid of lines, it is a logical impossibility that it may remove those lines. Thus, the behavior alleged to be equivalent to anti-aliasing clearly does not occur at all.

More generally, the Examiner cites steps 1327 and 1329 of Daly as teaching the limitation of Claim 19. The sequence of operations of which steps 1327 and 1329 are a part is reproduced below:

FIG. 13b is a flow chart further illustrating the method of interpolating the drawing color of the character and the background. Steps 1326-1331 are performed for each color component, i.e., red, green, and blue.

In step 1326, the color bits of the particular component are extracted from the back round and drawing colors. Typically, there are 3 bits for red, 3 bits for green, and 2 bits for blue, stored in fixed locations of the drawing and background colors.

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In step 1327, the background color bits are subtracted from the drawing color bits in order to calculate $(c-b)$ as in the alternate expression of the formula above. Steps 1338 and 1339 effectively multiply the gray scale value (a) times the difference between the background color and the drawing color $(c-b)$ by means of a lookup table. In step 1328, the value calculated in step 1327 is combined with the bit representation of the gray scale value to produce an index to a lookup table. In step 1329, the lookup is performed using a predetermined interpolation table containing values corresponding to $(ax(c-b))$.

In step 1330, the drawing color is added back in to produce a value equivalent to $(ax(c-b)+b)$. Finally, in step 1331, the result is stored in the proper bit locations of the drawing color to be written to screen memory. Daly, col. 16, ln. 42-68.

The Applicants respectfully submit that the cited passage contains no mention of anti-aliasing. Thus, the passage clearly does not teach or suggest "perform[ing] interpolation based on pixels constituting the original thin lines, not based on pixels obtained by anti-aliasing" as required by Claim 19.

Furthermore, the Examiner argues that "[i]t would have been obvious at the time of the invention was made to one of ordinary skill in the art to modify Sonobe's suggestion of anti-aliasing with Daly et al.'s teaching of anti-aliasing, because Daly et al.'s teaching reduces anti-aliasing and distortion in col. 4, line 17." OA, pg. 31. The Examiner additionally argues that "Sonobe . . . does suggest anti-aliasing as shown in fig. 6 by two black squares at the bottom of fig. 6 that are not desirable and suggests a technique as shown in fig. 7 to correct the anti-aliasing as shown by the bottom right of fig. 7." OA, pg. 30.

The Applicants respectfully submit that no motivation exists to combine the smoothing method taught by Sonobe with the anti-aliasing method allegedly taught by Daly. Sonobe defines a "smoothing processing" as "a processing to smooth an oblique line." Sonobe, col. 3, ln. 31-33. Anti-aliasing is a technique used in the art to remove unwanted lines. It follows that anti-aliasing is redundant with the smoothing processing taught by Sonobe. Because of this redundancy, no motivation exists to combine Sonobe with other techniques to smooth unwanted lines. Furthermore, the Examiner concedes that Sonobe, in Fig. 7, teaches a technique to remove the unwanted dots of Fig. 6.

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Because Sonobe already teaches the relevant technique, no motivation exists to combine Sonobe with other teachings accomplishing the same goal.

For at least these reasons, the Applicants respectfully submit that claim 19 is not obvious in view of Sonobe and Daly and earnestly solicit allowance of the claim.

NEW CLAIMS:

Claim 32:

Claim 32 has been added as follows: "The image transform method of claim 5, wherein the rank order processing includes: raster-scanning a window enclosing a target pixel and one or more of its neighboring pixels; and computing the output value of the target pixel by performing an averaging operation on the pixels enclosed within the window."

This claim further limits claim 5 to specify that the rank order processing includes raster-scanning a window. The window encloses a target pixel as well as one or more pixels neighboring the target pixel. The output value of the target pixel is computed by performing an averaging operation on the pixels enclosed within the window. The addition of Claim 32 does not add any additional information to the specification.

Support for Claim 32 is believed to exist within the specification. As one example, the specification states, "Specifically, the rank order processing is performed by raster-scanning a window, enclosed by a broken line 21 in FIG. 3A, in the direction indicated by an arrow 22, and the pixel positions are adjusted in accordance with the even numbers of the pixels in the window. In the area enclosed by the broken line 21, four windows are defined by a pixel 23 at the second row and the second column, a pre-scan pixel (second row and first column) and the pixels along the preceding line (first row and first column and second column), and the median operation, for example, is performed for the four windows to determine the output value for the pixel 23 on the second row in the second column." App., para. 0063.

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It is believed that Claim 32 is not taught by Miyake because the method taught by Miyake for creating a smooth edge does not comprise an averaging operation. Miyake teaches that "[s]orted pixels within the block containing E are substituted by MAX in a number equivalent to DOTMAX in descending order of the pixel values by the dot placing means 416, and MIN is substituted for the other pixels in the block." Miyake, col. 14, ln. 58-61. The method disclosed in the cited passage comprises selecting two extreme values. This is not equivalent to an averaging operation, which involves selecting a value reflecting the central tendency of a set of values.

Claim 33:

Claim 33 has been added as follows: "The image transform apparatus of claim 15, wherein the rank order processing includes: raster-scanning a window enclosing a target pixel and one or more of its neighboring pixels; and computing the output value of the target pixel by performing an averaging operation on the pixels enclosed within the window."

This claim further limits claim 15 to specify that the rank order processing includes raster-scanning a window. The window encloses a target pixel as well as one or more pixels neighboring the target pixel. The output value of the target pixel is computed by performing an averaging operation on the pixels enclosed within the window. The addition of Claim 33 does not add any additional information to the specification. Support for Claim 33 is believed to exist within the specification. It is noted that the limitation added by Claim 33 to Claim 15 is substantially similar to the limitation added by Claim 32 to Claim 5. It is further noted that the apparatus of Claim 15 is analogous to the method of Claim 5. Therefore, the passage cited as support for Claim 32 also supports Claim 33. Furthermore, the reasons why it is believed that Claim 32 is not taught by Miyake apply equally to Claim 33.

CONCLUSION

In view of the forgoing remarks, it is respectfully submitted that this case is now in condition for allowance and such action is

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respectfully requested. If any points remain at issue that the Examiner feels could best be resolved by a telephone interview, the Examiner is urged to contact the attorney below.

No fee is believed due with this Amendment, however, should a fee be required please charge Deposit Account 50-0510. Should any extensions of time be required, please consider this a petition thereof and charge Deposit Account 50-0510 the required fee.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Ido Tuchman', is written over a horizontal line.

Dated: August 15, 2006

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